

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

PMT0204 – FUNDAMENTAL MATHEMATICS II

(All sections / Groups)

25 OCTOBER 2019
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **6 pages** including cover page and mathematical formulas with **4 Questions** only.
2. Answer all **FOUR (4)** questions
3. Write all your answers in the answer booklet provided.
4. Only NON-PROGRAMMABLE calculators are allowed.

Question 1 (25 Marks)

a) Given $A = \begin{bmatrix} 9 & 1 & 5 \\ 4 & 7 & -3 \\ 1 & 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 5 & 1 & 0 \\ -2 & 3 & -4 \end{bmatrix}$, $C = \begin{bmatrix} -1 & 4 \\ -3 & 5 \\ 2 & 7 \end{bmatrix}$. Find

i. $C^T - 2B$

(3 marks)

ii. $A \cdot C$

(5 marks)

b) Find the inverse of $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 3 & -1 \\ -1 & 2 & 1 \end{bmatrix}$.

(12 marks)

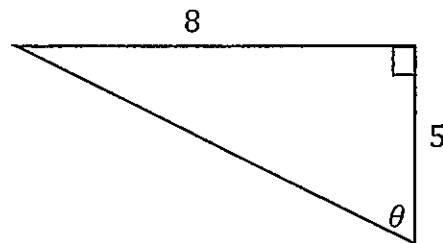
Hence, solve the system of equation by using inverse method.

$$\begin{aligned} 2x + y + z &= -1 \\ x + 3y - z &= 3 \\ -x + 2y + z &= 5 \end{aligned}$$

(5 marks)

Question 2 (25 Marks)

a) Find the six trigonometric function values of θ .



(7 marks)

b) Based on value of special triangle, find

i. $2 \sin(30^\circ) + \cot(45^\circ)$

(3 marks)

ii. $\cos(60^\circ) - \tan(60^\circ)$

(3 marks)

c) Sketch the graph of function

$$y = 3 \sin(x + \pi) + 1$$

(7 marks)

with all the key points for one cycle.

Hence, find the amplitude and period of the function.

d) Solve $\triangle ABC$ given $a = 5$, $B = 96^\circ$, $C = 15^\circ$

(5 marks)

Continued...

Question 3 (25 Marks)

a) Find the derivative of the following functions.

i. $f(x) = 3x^3 + 2x^{\frac{1}{3}} + 4x - 6$ (3 marks)

ii. $f(x) = (2x - 3)(x^2 + 4)$ (6 marks)

b) Given $f(x) = x^4 + 2x^3 - 4x^2 + 5x - 18$. Evaluate $f'''(-2)$. (4 marks)

c) Find the interval of increasing and decreasing of the function
 $f(x) = x^3 - 3x^2 - 9x + 4$ (12 marks)

Question 4 (25 Marks)

a) Evaluate the indicated limit, if exist.

i. $\lim_{x \rightarrow 0} (x^2 - 3x + 1)$ (2 marks)

ii. $\lim_{x \rightarrow -1} \frac{x^2 + 3x + 2}{x^2 - x - 2}$ (4 marks)

iii. $\lim_{x \rightarrow \infty} \frac{2x^2 - x + 1}{4x^2 - 3x - 1}$ (6 marks)

b) Find the general antiderivative of the following.

i. $\int (3x^4 - 3x - 1) dx$ (3 marks)

ii. $\int (4x - e^x) dx$ (2 marks)

c) Compute the integral.

$$\int_0^2 (x^3 + 3x - 1) dx$$
 (4 marks)

d) Find the area bounded by the curves $y = 3 - x^2$ in the interval $x = -3$ and $x = 1$. (4 marks)

End of Questions.

Course: Fundamental Mathematics II
Code: PMT0204

Matrices

Inverse of a 2×2 matrix

If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then $A^{-1} = \frac{1}{ad-bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$, where $ad-bc \neq 0$.

Determinant of a 3×3 matrix

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = a_1 \begin{vmatrix} b_2 & c_2 \\ b_3 & c_3 \end{vmatrix} - b_1 \begin{vmatrix} a_2 & c_2 \\ a_3 & c_3 \end{vmatrix} + c_1 \begin{vmatrix} a_2 & b_2 \\ a_3 & b_3 \end{vmatrix}$$

Cramer's Rule for 3×3 matrix

$$a_1x + b_1y + c_1z = d_1$$

$$a_2x + b_2y + c_2z = d_2 \quad \text{then } x = \frac{D_x}{D}, y = \frac{D_y}{D}, z = \frac{D_z}{D} \text{ where}$$

$$a_3x + b_3y + c_3z = d_3$$

$$D = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}, D_x = \begin{vmatrix} d_1 & b_1 & c_1 \\ d_2 & b_2 & c_2 \\ d_3 & b_3 & c_3 \end{vmatrix}, D_y = \begin{vmatrix} a_1 & d_1 & c_1 \\ a_2 & d_2 & c_2 \\ a_3 & d_3 & c_3 \end{vmatrix}, D_z = \begin{vmatrix} a_1 & b_1 & d_1 \\ a_2 & b_2 & d_2 \\ a_3 & b_3 & d_3 \end{vmatrix}$$

Trigonometry

Law of Sine

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Cosine

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

Pythagorean Identity

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\tan^2 \theta + 1 = \sec^2 \theta$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

Continued...

Derivatives

$$f'(a) = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$$

Differentiation Rules***General Formulae***

$$\begin{aligned} 1. \frac{d}{dx} [f(x)g(x)] &= f(x)g'(x) + g(x)f'(x) & 2. \frac{d}{dx} \left[\frac{f(x)}{g(x)} \right] &= \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2} \\ 3. \frac{d}{dx} (x^n) &= nx^{n-1} & 4. \frac{d}{dx} [f(u)] &= \frac{dy}{du} \cdot \frac{du}{dx} \end{aligned}$$

Exponential and Logarithmic Functions

$$\begin{aligned} 1. \frac{d}{dx} (e^x) &= e^x & 2. \frac{d}{dx} (a^x) &= a^x \ln a \\ 3. \frac{d}{dx} (\ln x) &= \frac{1}{x} & 4. \frac{d}{dx} (\log_a x) &= \frac{1}{x \ln a} \end{aligned}$$

Trigonometric Functions

$$\begin{aligned} 1. \frac{d}{dx} (\sin x) &= \cos x & 2. \frac{d}{dx} (\cos x) &= -\sin x \\ 3. \frac{d}{dx} (\tan x) &= \sec^2 x & 4. \frac{d}{dx} (\csc x) &= -\csc x \cot x \\ 5. \frac{d}{dx} (\sec x) &= \sec x \tan x & 6. \frac{d}{dx} (\cot x) &= -\csc^2 x \end{aligned}$$

Table of Integrals

$$\begin{aligned} 1. \int u \, dv &= uv - \int v \, du & 2. \int u^n \, du &= \frac{u^{n+1}}{n+1} + C, \quad n \neq -1 \\ 3. \int \frac{du}{u} &= \ln|u| + C & 4. \int e^u \, du &= e^u + C \\ 5. \int \sin u \, du &= -\cos u + C & 6. \int \cos u \, du &= \sin u + C \\ 7. \int \sec^2 u \, du &= \tan u + C & 8. \int \csc^2 u \, du &= -\cot u + C \\ 9. \int \sec u \tan u \, du &= \sec u + C & 10. \int \csc u \cot u \, du &= -\csc u + C \end{aligned}$$

Continued...

Application of Integrals:***Areas Between Curves***

$$A = \int_a^b [f(x) - g(x)] dx$$

$$A = \int_c^d [w(y) - v(y)] dy$$

Volume by Disks

$$V = \int_a^b \pi [R(x)]^2 dx$$

$$V = \int_c^d \pi [R(y)]^2 dy$$

Volume by Washer

$$V = \int_a^b \pi ([f(x)]^2 - [g(x)]^2) dx$$

$$V = \int_c^d \pi ([w(y)]^2 - [v(y)]^2) dy$$

End of Page.

